

the nose, or again as if he had painted feet instead of hands.

There is one instance so much in point that we may at once refer to it. One artist, who shall be nameless, has attempted to grace his picture by introducing into it a rainbow. Now if the rainbow had been part of the human form it would have been studied, there would have been books about it, and the artist would have made it as much his own as the student of physical science, since some artists study anatomy as closely as does the man of medicine, but, because the rainbow happens to lie outside that branch of scientific knowledge which is generally supposed to be the only branch to which artists need turn their attention, the painter thinks that he may treat it anyhow. Thus we have had rainbows with the colours—which in nature are absolutely definite in their order and arrangement—painted in reverse order; again, we have had a rainbow, which must always appear to form part of a circle, painted in perspective; but the rainbow fancier of this year has almost transcended the want of observation shown by his predecessors. Possibly ignorant of the fact that all primary rainbows are alike; that the order of colours, from red through orange, yellow, green, blue, indigo, to violet, is dominated by a most rigid law, to which there is, and can be, no exception; the artist has chosen to paint his rainbow with the violet in the middle. This seems to indicate either such looseness of observation or such contempt for nature—and the painter may take his choice between these two alternatives—that we doubt whether side by side with either there can exist that sympathy with nature which must lie at the root of all good work in art. We shall show on a subsequent occasion that this picture is only typical of a good deal of artistic work, which must in the nature of things act like a discord, and put the eye and the heart of the painter out of tune.

Those branches of science to which we have to make reference in these columns have to do of course with the forms and colours of clouds and sky and natural objects generally, and the laws of reflection, and if an artist will paint suns and moons, then with those elementary astronomical principles which have to deal with the appearances of these bodies, and which are not beyond the comprehension of a child in the Fourth Standard of a public elementary school. It is not therefore imposing too much upon an artist that he should know these things, and it is not too much to suppose that one who paints work on which he wishes to build his fortune or his reputation as the case may be, should wish to appeal to a more or less cultured audience. At present, perhaps, it is only a select few who notice and deplore this want of harmony with nature which marks the productions of so many of our artists; but the love of physical science among the great mass of mankind grows stronger and more strong, and the circle of those who can discriminate between fact and fancy as displayed in the works which grace the walls of our picture galleries is daily becoming a wider one. We would therefore utter a word of warning to the artist who allows blunders to creep into his picture because he thinks nobody will find them out. Somebody is sure to find them out.

The opportunities which artists in following their profession have of studying nature in very varied moods enable

them to see the actual phenomena, where *a priori* considerations leave a student who lacks such opportunities entirely in the dark. Several very interesting questions are raised by some of the pictures in this year's Academy, and the candid critic must acknowledge that many of them give much food for thought and suggestions for future inquiry and study on his own part.

THE TRANSIT INSTRUMENT

A Treatise on the Transit Instrument as Applied to the Determination of Time; for the Use of Country Gentlemen. By Latimer Clark, M.I.C.E., &c. (Published by the Author.)

IT is something new to have a book on the transit instrument for the use of country gentlemen. It is something still newer to find that book brought out by an eminent engineer. In fact we may regard the publication of such a book, under such conditions, as a sign of the times, and as an indication of the slow but sure way in which science, and even the methods of science, are interesting a gradually increasing number of our educated classes. Mr. Latimer Clark has done his work in a most admirable manner, and no country gentleman who wishes to know a little more than he does at present about the practical working of a most fascinating branch of science, could do better than invest, not only in the book, but in the very satisfactory and handy little instrument which Mr. Clark has been wise enough to produce side by side with it. This transit instrument to which we refer, and which can be obtained of Mr. Coppock of Bond Street, is an excellent one of its kind. It is cheap—costing only about 10*l.*—and it is simple. The many parts of the instrument which form necessary adjuncts to it when used in an observatory are of course suppressed, but nothing is wanting which is really of importance to that public which Mr. Latimer Clark wishes to educate in its use. The author is quite wise in the way he goes to work. We naturally have a description of the instrument, and reference to the way in which it can be most conveniently and satisfactorily employed, nor are those necessary adjustments omitted without which of course the simplest instrument would be of very little use. Full instructions are then given for putting it in position, and Mr. Clark's form of instrument has a cover, by means of which, when once placed in position, say, out on a stone pillar on a lawn with a good north and south line, it can be left out with very little chance of its taking any harm in all weathers. The actual taking of transits, both of the sun and stars, are then dealt with, and we should add here that the transit eyepiece is armed with a system of seven vertical wires, so that the means of several transits over the wires can be taken in the ordinary way. The only objection we have so far found to Mr. Latimer Clark's form, is that there are no means of adjustment for the verticality of the wires. We regard this as a point which should be looked to, in case our author should be fortunate enough to induce a great many people to employ this cheap and simple form.

The corrections for longitude and latitude are next given, and we are glad to see that the book deals with these matters in a way not only far from dry, but so as to introduce a considerable quantity of very useful astro-

nomical knowledge put in a very simple and taking form. Thus, for instance, when Mr. Clark urges, and rightly urges, that the latitude of any particular house where it may be suggested to put up one of these instruments is more likely to be accurately determined by a reference to the Ordnance Map than in any other way, we are not only told that the Ordnance Map may be got for 1s., but the ignoramus is not even forgotten, and the way in which longitude is marked on the map is clearly stated. Mr. Clark it will be seen has spared no pains to make everything as clear as possible to everybody. Here, for instance, is what he says on counting time to a beginner in astronomical work:—

"In taking the time of transit by a watch some difficulty will at first be experienced, owing to the fact that watches tick various numbers of beats in a minute, but rarely any direct multiple of the second. Having carefully ascertained the number, the watch is placed to the ear at any even ten or twenty seconds, and the counting is continued by sound, thus: One and, one and, two and, two and, three and, three and, fifteen, fifteen, &c. In recording the transit, the minutes and seconds at the time of starting are noted, and the number of additional ticks is counted by ear, and these are afterwards converted into seconds and added. When a single observation is considered sufficiently accurate for practical purposes, it may be conveniently recorded by a chronograph, which is started in exact accordance with your clock a few minutes before it is required, and is stopped at the exact instant of transit. At night this dispenses with the necessity of referring to a lantern for time. These chronographs may now be obtained at a very moderate price, and when they beat quarter-seconds are very useful for counting, and for carrying the time of a clock or chronometer into the open air, and might be advantageously used on shipboard. The portable American clocks, which are sold everywhere for a few shillings, sometimes beat quarter-seconds, and serve well for counting time. They may be easily converted into rough chronographs by adding a stop movement in the form of a light spring pressing against the balance wheel; the second hands are, however, loose and inaccurate. A servant may be taught to record transits with the assistance of one of these chronographs very correctly.

"The writer, however, employs an arrangement which he considers still preferable. A rough pendulum about ten inches long is constructed out of a wire suspended by a flat spring or by a double loop of wire, and screwed at the bottom through a flat leaden plumb-bob; it is adjusted so as to beat half-seconds correctly. A very small glass bead or button is suspended loosely at the lower end of the rod, and strikes against a thin metal plate at each oscillation; it is started by a trigger of wood or wire, supporting the plumb-bob at a definite angle, and insuring uniformity of swing. This is fixed on a board and hung within reach of the instrument. It may be used in several ways; the trigger may be pulled at the instant of transit, the first tick being counted as one, and the counting being continued while the observer rises from his position, and obtains at leisure a coincidence with a given second on his watch, the number of beats being converted into seconds and deducted from the time noted. The observation is noted thus, 46m. 28-21, and is afterwards converted into

$$\begin{array}{r} 8 \quad 46 \quad 28 \\ - \quad \quad 10 \cdot 5 \\ \hline 8 \quad 46 \quad 17 \cdot 5 \end{array}$$

"Or the observer may start the pendulum just before the transit occurs, and having obtained a coincidence with his watch may continue to count by ear. The pendulum

may, if preferred, be made to tick seconds by muffling one side of the metal strip with a piece of felt, and it may be removed after an observation, leaving the support and striking plate attached to the pillars of the transit. It oscillates on a rod or knife edge, and will continue in motion for two or three minutes."

As an appendix to the book we find transit tables giving the Greenwich mean time transit of the sun and certain stars for every day in the year, computed from the *Nautical Almanac*, and there is also a table for converting intervals of sidereal time into equivalent intervals of mean solar time. More recently the author has published a set of transit tables separately, and we would recommend those who use his book on the transit instrument to obtain them. To all who are not familiar with the use of the tables, clear and simple instructions are given, and we think they will prove of great use to those for whom they are intended.

Mr. Latimer Clark has certainly well deserved the thanks of all interested in astronomy, for the pains he has taken in thus endeavouring to popularise an instrument which, although it is the most important instrument used in astronomy for the determination of position, is at the same time one from which an immense amount of pleasure can be obtained by the merest tyro in science, whilst the great advantage of using such an instrument as this is, that no one can use it without rendering himself thoroughly familiar with some of the most important problems which lie at the root of any useful knowledge touching the stars, or the planet on which we dwell.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

Fossil Algæ

IN a review of Saporta's work on "Fossil Algæ" in *NATURE* (vol. xxvii. p. 514) there are certain opinions brought forward which ought not to be passed by without some remarks. At first it should be stated that Saporta, while still insisting upon the vegetable nature of his so-called "algæ," does not only defend his views about those doubtful bodies which have been the objects of my criticisms, but also "defends" true algæ, concerning which I have never expressed any doubt. Such are, for example, the *Florideæ* represented on the first three plates in his work, and by "defending" them he puts me in a somewhat false position, at least in the eyes of the readers who have not studied my work.¹ The real fact is that I have only questioned—and still do so—the vegetable nature of almost all those objects which Schimper in Zittel's "Handbuch der Palæontologie" comprises under the head of "*Algæ incertæ sedis*." There is consequently some exaggeration in Saporta's statement of my opinion.

Now it is quite clear that fossil trails of animals must occur in most cases in relief on the under sides of the slabs, the tracks in such cases being impressions in the soft sand or mud, which have since been filled by sediment. And it is also, quite natural that the trails of animals should especially be found where there are alternating beds of sandstones and shales.

Now it is a fact that the *Bilobites*, as well as *Eophyton*, always occur in this way, projecting as convex bodies on the under sides

¹ A. G. Nathorst, "Om spår af några evertebrerade djur arbdernas paleontologiska betydelse." With a French *résumé*, "Mémoire sur quelques traces d'animaux sans vertèbres et de leur portée paléontologique." (*Svenska Vetenskaps Akademiens Handlingar*, Bd. xviii., No. 7. Stockholm: Norsted och Söner, 1880.)